IMBER, A NEW GENUS FOR THE AUSTRALIAN HAWK MOTH *LANGIA TROPICUS* MOULDS, 1983 (LEPIDOPTERA: SPHINGIDAE)

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Abstract

A new genus, *Imber*, is erected for the Australian hawk moth *Langia tropicus* based on differences in adult, larval and pupal morphology. Differences from the genus *Langia* are documented. Most notable differences include the shapes of the male uncus and gnathos, the arrangement of larval tubercles, the shape of the larval head and the shape of the pupa.

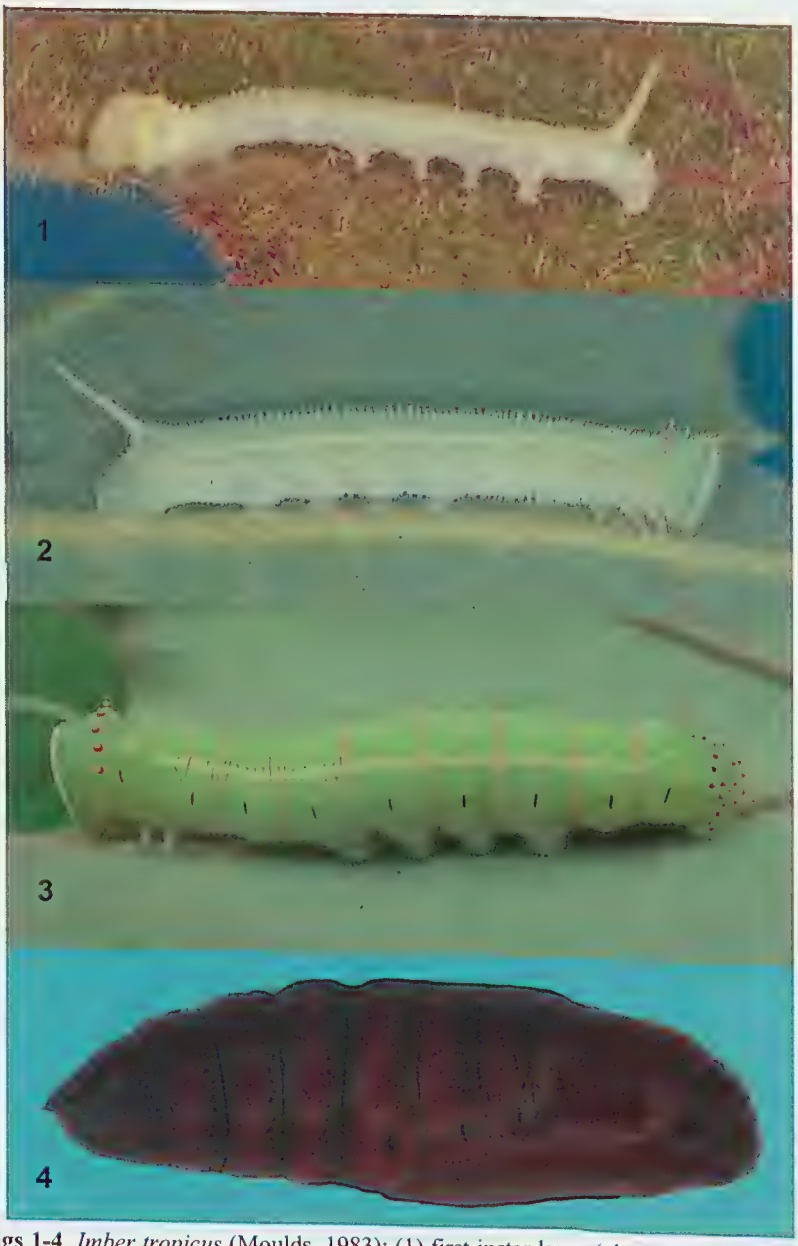
Introduction

When *Langia tropicus* Moulds, 1983 was originally described from Australia, nothing was known about its life history. At that time, the general appearance of the adult, with its brownish tones and scalloped outer forewing margins, suggested that it belonged in the genus *Langia* Moore, 1872. Nevertheless, Moulds (1983) noted differences in size, forewing and thoracic maculation, and male genitalia relative to other *Langia* species.

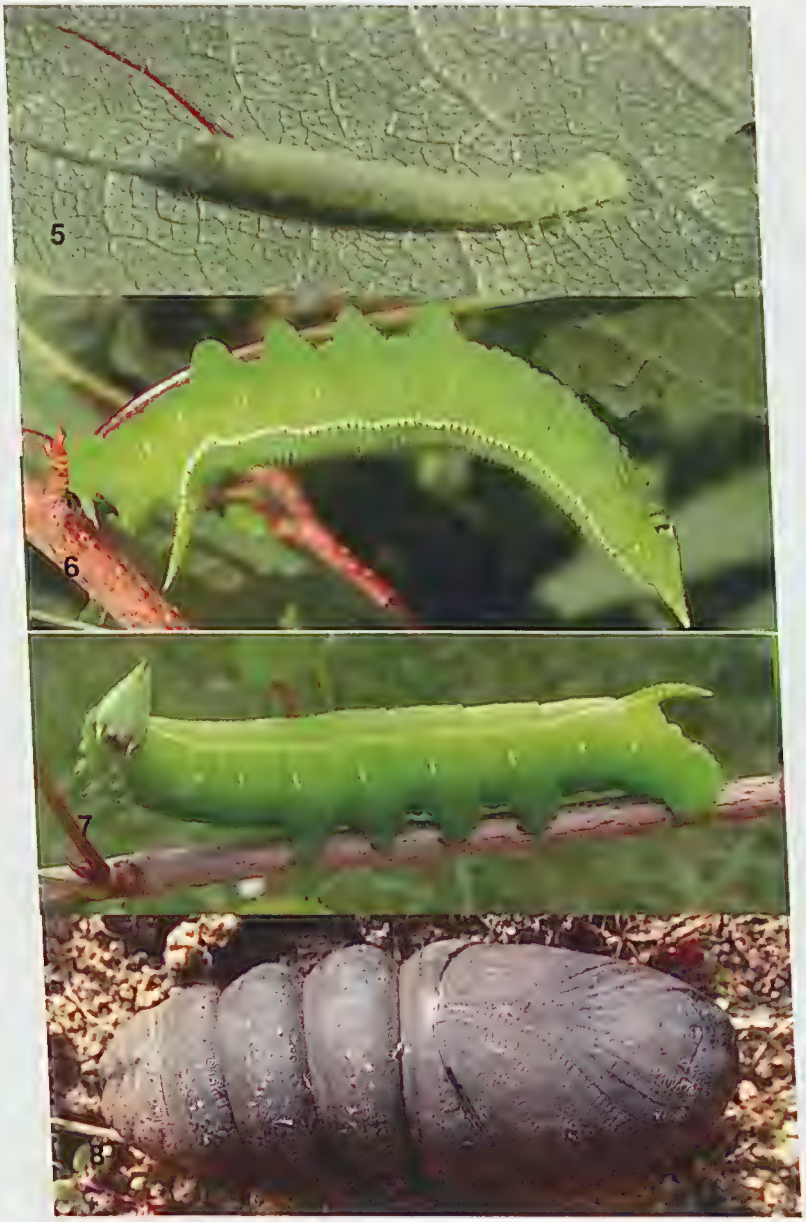
The genus *Langia* was erected to accommodate *L. zenzeroides* Moore, 1872 and *L. khasiana* Moore, 1872 (Moore, 1872). Subsequently, *L. khasiana* was synonymised with *L. zenzeroides*. Currently the nominotypic race of *L. zenzeroides* and two additional subspecies, *L. z. formosana* Clark, 1936 and *L. z. nawai* Rothschild & Jordan, 1903, are recognized from across the Oriental region (Kitching & Cadiou, 2000). Rothschild & Jordan (1903) provided brief descriptions of the larva and pupa of *L. zenzeroides*.

The recent discovery of the life history of *tropicus* and description of the immature stages by Lane & Moulds (2010) gave us cause to reconsider the generic placement of *tropicus*. Jean Haxaire of Laplume, France, provided the authors with a series of quality digital images of all immature stages of *zenzeroides* to compare with the immature stages of *tropicus*. The morphological differences between the larvae and pupae of *tropicus* and *zenzeroides* are profound. These differences indicate that *tropicus* and *zenzeroides* are not congeneric and that generalized adult similarities are simply the result of convergence.

Below we erect the monotypic genus *Imber* gen. n. to accommodate *tropicus* and discuss the differences in larval, pupal and adult morphology between it and *Langia*.



Figs 1-4. *Imber tropicus* (Moulds, 1983): (1) first instar larva (photo M. Moulds); (2) fourth instar larva (photo David Lane); (3) fifth instar larva showing the rounded head, large tubercles on prothoracic shield, stumpy caudal horn and large tubercles on anal plate (photo David Lane); (4) pupa, lateral view (photo M. Moulds).



Figs 5-8. *Langia zenzeroides* Moore, 1872: (5) first instar larva; (6) fourth instar larva; (7) fifth instar larva showing the conical head turned front on to camera and the well-developed caudal horn; (8) pupa, ventral view. Photos Jean Haxaire.

Tribe Smerinthini
Genus *Imber* gen. n.

Type species: *Langia tropicus* Moulds, 1983, here designated.

Included species: *tropicus* (Moulds, 1983), **comb. n.**

Etymology: From the Latin *imber* meaning rain, a storm, or pelting rain , and referring to the appearance of adults and larvae following the first big rains of the wet season; masculine.

Diagnosis

Male: Scales on head and body narrow, erect on head, semi-prostrate on body, densely packed giving a furry appearance. Eyes bare, unlashed. Antennae tapering to a pointed apex; apical segment a little shorter than preceding two combined, scaled dorsally; not reaching apex of fore wing cell; ventrally compressed laterally and tending keel-shaped, cilia well developed. Labial palps densely scaled but lacking microtrichia on inner surface of segment 1; segment 2 not abnormally swollen. Pilifer with a dense tuft of long bristles apically. Base of proboscis concealed. Fore leg epiphysis long, slender and spine-like, tarsal combs present on all segments, doubling of external row of basitarsal spines on outer face; mid and hind tarsi without combs; mid and hind tibial spurs without combs; outer apical hind tibial spur much less than half the length of hind basitarsus and a little longer than inner apical spur; pulvillus present, well developed; paronychium slender and spine-like, bilobed with the upper lobe longest. Fore wing termen scalloped for its full length but with the penultimate indentation always shallow, apex not produced. Abdomen with small tufts of scales sublaterally on abdominal tergites most pronounced on segments 5-7; apex not broadly tufted but with small ventral scale tufts. Genitalia with uncus and gnathos tending tubular, curved, widely opposed and together pincer-like; stridulatory scales on valve lacking; aedeagus lacking cluster of small spines near apex.

Female. Similar to male but lacking the apical ventral scale tufts.

Larva (Figs 1-3)

First instar with prothoracic shield bearing a prominent transverse row of evenly spaced tubercles across its width; a submedial pair of prominent primary tubercles on anal plate; caudal horn slender and either straight or slightly curved forwards. Second to fourth instars with head rounded in shape, lying flat against prothorax and also bearing a pair of conical tubercles on the anterior vertex one either side of the coronal suture and larger than any other tubercles on head; tubercles on the prothoracic shield similar to those of first instar. Instars 1-4 all heavily stippled with numerous small white tubercles. Last instar larva (fifth instar) with head rounded and lying flat against prothorax as in earlier instars but the large, conical tubercles on the vertex of earlier instars are lost; body smooth in appearance without the

small, white tubercles of earlier instars; caudal horn greatly reduced to little more than a smooth, pointed knob; tubercles on anal plate all more or less similar in size.

Pupa (Fig. 4)
Glossy; stout and thick-set in overall shape; proboscis more or less confluent with the profile of head and body and not developed into a keel shape; metathoracic spiracle not concealed; traction ridges absent; cremaster terminating in a simple tubular projection.

Distinguishing features
Adults of *Imber* gen. n. differ from the superficially similar genus *Langia* in having the fore legs slender with a slender spine-like epiphysis rather than being robust and thick-set with a broad epiphysis as in *Langia*; and the fore wing termen is scalloped for its full length rather than reducing and fading out on distal third or so as in *Langia*. The male genitalia show significant differences [compare figs of *tropicus* in Moulds (1983) with those of *L. zenzeroides* in Bell and Scott (1937)]. The uncus and gnathos of *Imber* are almost tubular structures, positioned widely, bifid and pincer-like, whereas the uncus of *Langia* is essentially flat and the gnathos reduced to a pair of finger-like structures.

Larvae through the first four instars of both genera are heavily stippled with very small, white, tubercles giving the body surface a rough, granulated appearance (Figs 1, 2, 5, 6). Apart from this character larvae of *Imber* and *Langia* are quite different morphologically. The 1st instar larva of *Imber* (Fig. 1) has a submedial pair of prominent tubercles on the anal plate which are lacking in *Langia* (Fig. 5). Further, the caudal horn of *Imber* is sturdy and straight or slightly curved forwards, whereas that of 1st instar *Langia* larva is finer, nearly twice as long, and curves to the rear. Additionally, the 1st instar larva of *Imber* has a prominent transverse row of evenly spaced tubercles across the prothoracic shield that persist throughout its development, an attribute lacking in *Langia*.

While differences in the 1st instar larva are significant, characters in the remaining instars confirm the proposed generic placement. In the 2nd to 4th instars of *Imber*, the head is rounded, lies flat against the prothorax, and bears a pair of elongate conical tubercles on the anterior vertex, one either side of the coronal suture (Fig 2). In addition, the tubercles on the prothoracic shield of *Imber* remain as described in the 1st instar. In marked contrast, in the 2nd to 5th instars of *Langia*, the head is pitched decidedly forward with the apex ending in an exaggeratedly bisected point (Figs 6, 7). In the last instar (5th), the head of *Imber* remains rounded and continues to lie flat against the prothorax but the elongate conical tubercles on the vertex are lost (Fig. 3). The stippling of small, white tubercles is also lost giving the larva a very smooth appearance. In addition, the caudal horn is greatly reduced to little

more than a smooth, pointed, conical knob, and the anal plate is covered with smooth, conical tubercles of near equal size.

The pupal distinctions between *Imber* and *Langia* are nearly as dramatic as those of the larva. The pupa of *Imber* is smooth, glossy, and has a well-defined, heavily sclerotized cremaster with a distal linear projection (Fig. 4). In contrast, the pupa of *Langia* is slightly rough, dull, more robust and stout, with exaggeratedly rotund abdominal segments, and has a very small, rudimentary cremaster (Fig. 8).

Distribution

The single included species is endemic to Australia. It occurs widely across the monsoonal north of the continent from Broome in Western Australia (Hill, Marshall and Moulds, pers comm.) to north-eastern Queensland (Lane and Moulds, 2010).

Discussion

Adult morphology provides only weak guidance for tribal placement of *Imber*. The rounded larval head of *Imber* suggests placement in the Sphingulini although the dorsal projections on the head of earlier instars if interpreted as remnants of a conical head would suggest Smerinthini. The deep pits anterior of the spiracles in the pupa are indicative of a relationship with Smerinthini genera such as *Polytychus* (I. Kitching, pers. comm.). We tenuously place *Imber* in the tribe Smerinthini where the adult and pupa seem most compatible with the genera currently placed there.

Acknowledgements

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